REMARKS

Responsive to the communication mailed December 18, 2001, Applicant provides the following remarks in an effort to more particularly point out the invention. Reconsideration and reexamination are respectfully requested.

Objection to Claim 5

Claim 5 has been cancelled, thereby rendering moot the Examiner's objection thereto under 37 CFR. 1.75(c).

35 U.S.C. §112 Rejections

Claims 1-38 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as his invention. Claims 5-7, 16-17, 20-21, 23-24, 28-29, 33-34, and 37-38 have been cancelled without prejudice, rendering the rejection thereof moot. Claims 1-4, 8-15, 18-19, 22, 25-27, 30-32, and 35-36 have been amended in an earnest effort to address the issues cited by the Examiner. Applicant respectfully submits that the claims, as amended, meet the requirements of 35 U.S.C. §112, second paragraph.

In regard to the terms "low" and "high" as used to describe HLB numbers, however, Applicant respectfully submits that these terms have a well-defined meaning in the art. In particular, a low HLB surfactant is a surfactant having an HLB less than about 15. Moreover, the use of high and low HLB surfactants has been described in the specification, e.g. on page 5 and following.

Also, the term "water contact angle" is well accepted in scientific literature, and has been

clearly defined on page 4 of the Specification. Please note the following statement on the 6th line below Equation [1]: "In sessile drop method, a drop of water is placed on the surface of interest and the angle is measured through the aqueous phase. Thus, the term contact angle used in the present invention refers to the water contact angle, which increases with increasing surface hydrophobicity."

Of course, when considering the definiteness of a term or a phrase relative to the requirements of §112, second paragraph, acceptability of claim language depends on "whether one or ordinary skill in the art would understand the bounds of the claim when read in light of the specification ... If the claims read in light of the specification reasonably apprise those skilled in the art of the scope of the invention, §112 demands no more". Credle v. Bond, 25 F.3d 1566, 1576, 30 U.S.P.Q.2d 1911 (Fed. Cir. 1994) (internal quotation omitted). Thus, "the PTO applies to the verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definition or otherwise that may be afforded by the written description contained in the applicant's specification." In re Morris, 127 F.3d 1048, 1054, 44 U.S.P.Q.2d 1023 (Fed. Cir. 1997).

Those skilled in the art would readily appreciate the bounds of the "low" HLB, "high" HLB, and "water contact angle" limitations in the claims, especially when read in light of the instant specification. Applicant respectfully submits, therefore, that Examiner's rejections under §112, second paragraph based on these terms should be withdrawn upon reconsideration.

35 U.S.C. §103 Rejections

Claims 1-11 and 13-17 have been rejected under 35 U.S.C. § 103, as being unpatentable over Yoon et. al. (U.S. Patent No. 5,670,056). Applicants respectfully traverse this rejection.

It is contended respectfully that Yoon teaches an entirely different process than that set forth in independent claim 1. First, Yoon et al. teaches a single-step hydrophobization, while independent claim 1 requires a two-step hydrophobization. In particular, independent claim 1 requires "increasing the hydrophobicity" of the particulate material and "adding a nonionic surfactant" of low HLB number to that the hydrophobicity of the material is further "increased." The claimed "nonionic" surfactants are hydrophobic and cannot readily adsorb on the surface of a particulate material unless the material is hydrophobic to begin with. Thus, claim 1 requires that the particulate material be hydrophobized in a first step and again in a second step by using a nonionic low HLB surfactant.

Moreover, Yoon et al. states in col. 4 line 49 that "The hydrophobizing reagent must be water soluble or water dispersable (e.g., an emulsion) in order to enable it to be applied to the surface of the particles being dewatered." The "nonionic" low HLB surfactant required by claim 1, however, is hydrophobic and, therefore, is substantially water insoluble.

As the Examiner knows, a 35 USC § 103 rejection may stand only when the prior art would have provided both a suggestion of the claimed invention and an expectation of success to one of ordinary skill in the art at the time the invention was made. *In re Dow Chemical Co.*, 837 F.2d 469, 5 USPQ2d 1529 (Fed. Cir. 1988). Yoon is devoid of any teaching or suggestion of a process including first and second hydrophobization steps wherein the second step includes use of a nonionic surfactant, as required by independent claim 1. As such, the claimed invention

could not have been obvious from the teachings of Yoon at the time it was made.

Moreover, as the Examiner knows, the initial burden of establishing a *prima facia* case of obviousness rests upon the Examiner. See, e.g., MPEP 2143. Three criteria must be met to establish a *prima facia* case of obviousness:

(1) there must be some suggestion or motivation in the references to combine the reference teachings;

(2) there must be some expectation of success; and

(3) the combined references must teach or suggest all of the claimed limitations.

Id.; In re Dow Chemical Co., 837 F.2d 469, 5 USPQ2d 1529 (Fed. Cir. 1988). In establishing a *prima facia* case of obviousness under 35 USC 103, it is incumbent upon the Examiner to provide a "clear and particular" showing of "actual evidence" of a suggestion, teaching, or motivation to combine references. In re Dembiczak, 50 USPQ 2d, 1614, 1617 (Fed. Cir. 1999). "Broad conclusory statements regarding the teachings of multiple references, standing alone, are not evidence." Id., citing McElmury v. Arkansas Power and Light Co., 995 F.2d 1576, 1578, 27 USPQ2d. 1129, 1131 (Fed. Cir. 1993) (internal quotations omitted).

In fact, in In re Dembiczak the Court of Appeals for the Federal Circuit recognized that "rigorous application" of the requirement for a showing of a teaching or motivation to combine references is the "best defense against the subtle but powerful attraction" of improper hindsight-based obvious analysis. Id.; See also, Para-Ordnance Manufacturing, Inc. v. SGS Importers International, Inc., 73 F.3d 1085, 37 USPQ2d 1237 (Fed. Cir. 1995). ("obviousness may not be established using hindsight or in view of the teachings or suggestions of the inventor"). This is especially true in cases where the ease with which the invention may be understood "may prompt

one to fall victim to the insidious effect of hindsight syndrome wherein that which only the inventor taught is used against its teacher." Id. citing W.L. Gore & Assoc., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 313 (Fed. Cir. 1983).

Here, Yoon fails to teach or suggest essential limitations of claim 1 requiring first and second hydrophobization steps and a nonionic low HLB surfactant, and the Examiner has not provided any evidence that the missing teachings would have been obvious from the prior art. Claims 5-7 and 16-17 have been cancelled, rendering the rejection thereof moot. Claims 2-4, 8-11, and 13-15, depend from independent claim 1 and are patentable over Yoon for the reasons discussed above by virtue of their dependency, as well as for other reasons. As such, Applicant respectfully submits that the Examiner's rejection of claims 1-11 and 13-17 under 35 U.S.C. § 103, as being unpatentable over Yoon et. al., should be withdrawn upon reconsideration.

Claim 12 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Yoon et al. 5,670,056 and Wang et al. 4,210,531. Claim 12 depends directly from claim 1, and therefore includes essential limitations not taught or suggested by Yoon as discussed above. Wang is also devoid of any teaching or suggestion of first and second hydrophobization steps wherein the second step includes a nonionic low HLB surfactant. In fact, the Examiner does not cite Wang as providing these missing teachings. As such, Applicant submits that the rejection of claim 12 under 35 U.S.C. 103(a) as being unpatentable over Yoon et al. 5,670,056 and Wang et al. 4,210,531 should be withdrawn upon reconsideration.

Claims 18-24 have been rejected under 35 U.S.C. 103(a) as being unpatentable over

Yoon et al. and Sanner 4,909,946. Sanner teaches a method of using a combination of using water-soluble polymer and aluminum ions.

In addition to requiring first and second hydrophobization steps and a nonionic surfactant, independent claim 18 requires adding "at least one inorganic electrolyte" to the slurry. As discussed above, Yoon fails to teach or suggest first and second hydrophobization steps and adding a nonionic low HLB surfactant as required by independent claim 18. Sanner does not provide these missing teachings, and is not cited by the Examiner as doing so.

Moreover there is nothing in the cited references that teaches or suggest combining an inorganic electrolyte in a slurry with the claimed nonionic surfactant, as required by independent claim 18. This combination provides synergistic effects as illustrated by Examples 16 and 17. In Example 16, the use of aluminum ions alone in the amount of 10 g/t decreased the moisture of a bituminous coal to 23.2%. Using 3 lb/t of tridecyldihydrogenphosphate (TDDP), the moisture was reduced to 16.0%. Using a combination of both, the moisture was reduced to 13.6%, demonstrating a synergistic effect, which was unexpected and, therefore, is patentable. The net effect is that the use of an inorganic electrolyte results in a decrease in the amount of the nonionic surfactant required in achieving a desired moisture reduction, which is of practical importance in industry.

Thus, neither Yoon nor Sanner, nor their combination, teaches or suggest essential limitations of independent claim 18. Claims 20-21 and 23-24 have been cancelled, and claims 19 and 22 depend from independent claim 18. Applicant respectfully submits, therefore, that the Examiner's rejection of claims 18-24 under 35 U.S.C. 103(a) should be withdrawn upon reconsideration.

Claims 25-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoon et al. and Sun 5,520,822. Sun teaches a method of combining a pulsating hyperbaric filter with a vibration to facilitate filtration.

Claim 25 requires first and second hydrophobization steps and a nonionic surfactant, as discussed above, as well as subjecting a filter cake formed by a filtration process to a "vibratory means."

As discussed above, Yoon fails to teach or suggest first and second hydrophobization steps and adding a nonionic low HLB surfactant as required by independent claim 25. Sun does not provide these missing teachings, and is not cited by the Examiner as doing so.

Moreover there is nothing in the cited references that teaches or suggest combining vibration of a filter cake formed in a process using a nonionic low HLB surfactant, as required by claim 25. As shown in Example 15, vibrating the filter cake in formed through use of a low HLB surfactant reduced the moisture beyond what can be achieved with mechanical vibration alone. This synergistic effect can be explained by the likelihood that the use of the low HLB surfactant (which was used as a hydrophobicity-enhancing agent) caused the water molecules on the surface less stable (or labile) on the surface of the particulate material, so that they can be removed more readily removed from the filter cake *via* mechanical vibration.

Thus, neither Yoon nor Sun, nor their combination, teaches or suggest essential limitations of independent claim 25. Claims 28-29 have been cancelled, and claims 26-27 depend from independent claim 25. Applicant respectfully submits, therefore, that the Examiner's rejection of claims 25-29 under 35 U.S.C. 103(a) should be withdrawn upon reconsideration.

Claims 30-34 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Yoon et al and Kenney 5,346,630. Independent claim 30 requires first and second hydrophobization steps and a nonionic surfactant, as discussed above, as well as subjecting addition of a surface tension lowering agent "during cake drying cycle time."

As discussed above, Yoon fails to teach or suggest first and second hydrophobization steps and adding a nonionic low HLB surfactant as required by independent claim 30. Kenney does not provide these missing teachings, and is not cited by the Examiner as doing so.

Moreover, the teachings of Kenney have been described in the Specification of the instant application, at line 7, 1st paragraph, page 5, as follows: "The U.S. Patent No. 5,346,630 teaches a method of pressure spraying a solution of a dewatering aid from a position *within the filter cake forming zone* of a filter just prior to the disappearance of the supernatant process water. This method, which is referred to as torpedo-spray system, ensures even distribution of the dewatering aid without becoming significantly diluted by the supernatant process water." This description was from Kenney in col. 4, lines 53-58. The term torpedo spray indicates that the spray nozzle is located *under water*. In the instant application, a surface tension lowering agent is sprayed "during cake drying cycle time." Contrary to the teachings of Kenney, claim 30 requires that the spray is made in air, i.e. the spray nozzle is located above water.

Thus, neither Yoon nor Kenney nor Wang, nor their combination, teaches or suggest essential limitations of independent claim 30. Claims 33-34 have been cancelled, and claims 31-23 depend from independent claim 30. Applicant respectfully submits, therefore, that the Examiner's rejection of claims 30-34 under 35 U.S.C. 103(a) should be withdrawn upon

reconsideration.

Claims 35-38 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Yoon et al., Sanner, Sun, and Kenney. Independent claim 35 requires first and second hydrophobization steps and a nonionic surfactant, as discussed above, as well as subjecting the filter cake to a "vibratory means" during addition of a surface tension lowering agent "during cake drying cycle time." As discussed above, Yoon fails to teach or suggest first and second hydrophobization steps and adding a nonionic low HLB surfactant as required by independent claim 30. Sanner, Sun, and Kenney do not provide these missing teachings, and are not cited by the Examiner as doing so. As discussed above, Yoon, Sanner, Sun, and Kenney also fail to teach use of a vibratory means and a surface tension lowering agent, as claimed.

Thus, none of the cited references, nor any combination thereof, teaches or suggest essential limitations of independent claim 35. Claims 37-38 have been cancelled, and claim 36 depends from independent claim 35. Applicant respectfully submits, therefore, that the Examiner's rejection of claims 35-38 under 35 U.S.C. 103(a) should be withdrawn upon reconsideration.

Applicant respectfully submits that in light of the foregoing remarks, all of the presently pending claims are now in a condition for allowance. Reexamination and reconsideration are, therefore, respectfully requested.

In the event the Examiner deems personal contact desirable in disposition of this case, the Examiner is respectfully requested to call the undersigned attorney at (603) 668-6560.

In the present amendment, claims 5-7, 16-17, 20-21, 23-24, 28-29, 33-34, 37-38 have

been cancelled, and claims 39-71 have been added. The present Amendment thus adds one additional independent claim in excess of three and eighteen (18) additional dependent claims in excess of 20. Form PTO-2038 authorizing credit card payment in the amount of $664 to cover $204 for the additional claim fees ($42 + (18x$9)), as well as $460 for a three-month extension of time is enclosed. In the event there are any fee deficiencies or additional fees are payable, please charge them (or credit any overpayment) to our Deposit Account No. 50-2121.

Respectfully submitted,

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Marked Up C py of Claims Showing Changes Made
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Claims 5-7, 16-17, 20-21, 23-24, 28-29, 33-34, 37-38 have been cancelled without prejudice.

New claims 39-71 have been added.

Claims 1-4, 8-15, 18-19, 22, 25-27, 30-32, and 35-36 have been amended as follows:

1. (Amended) A process for dewatering a slurry of [fine] hydrophilic particulate material comprising:[, which comprises the steps of]

   i) increasing the hydrophobicity of said [rendering the particulate] material; [moderately hydrophobic using appropriate means,]

   ii) adding a nonionic surfactant of low hydrophile-lipophile balance (HLB) number dissolved in [an appropriate] at least one organic solvent [or mixtures of solvents,];

   iii) agitating [the] said slurry to allow for [the] said nonionic surfactant [molecules] to adsorb on the surface of [the moderately hydrophobic particulate] said material so that its hydrophobicity is [substantially enhanced] increased;[,] and [then]

   iv) subjecting the [conditioned] agitated slurry containing [the particulate] said material[, whose water contact angle has now been greatly increased,] to a [suitable] mechanical method of dewatering[,

so that the moisture of the particulate material is greatly reduced].

2. (Amended) The process of claim 1 wherein said particulate matter comprises particles of less than 2mm in size [the fine particulate material is smaller than 2 mm in diameter].

3. (Amended) The process of claim 1 wherein the nonionic surfactant has its HLB number less than [about] 15.

4. (Amended) The process of claim 1 wherein said increasing the hydrophobicity step [the initial hydrophobization step] is achieved by using [appropriate] a surfactant[s] [and]or collector[s, including those that are normally used for flotation].

8. (Amended) The process of claim 1 wherein said increasing the hydrophobicity step [the initial hydrophobization step] comprises increasing the hydrophobicity of said material to exhibit a [renders the surface of the particulate material hydrophobic so that its] water contact angle [is considerably] less than 90°.

9. (Amended) The process of claim 1 wherein the particulate material includes material selected from the group consisting of: minerals, coal, plastics, metals, metal powders[,] and fly ash[, biological materials, etc].

10. (Amended) The process of claim 1 wherein the said mechanical [means includes] method of dewatering is selected from the group consisting of: vacuum filtration, pressure filtration, centrifugal filtration, and centrifugation.

11. (Amended) The process of claim 1 wherein the low HLB surfactant is selected from the group consisting of: fatty acids, fatty esters, phosphate esters, hydrophobic polymers, ethers, glycol derivatives, sarcosine derivatives, silicon-based surfactants and polymers, sorbitan derivatives, sucrose and glucose esters and derivatives, lanolin-based derivatives, glycerol esters, ethoylated fatty esters, ethoxylated amines and

amides, ethoxylated linear alcohols, ethoxylated tryglycerides, ethoylated vegetable oils, and ethoxylated fatty acids[, etc].

12. (Amended) The process of claim 11 wherein said low HLB surfactant [a hydrophobicity-enhancing reagent disclosed in claim 11] is blended with a vegetable, fish or animal oil containing triacylglycerols [to obtain synergistic improvement in dewatering fine particulate materials].

13. (Amended) The process of claim 1 wherein [the] said [appropriate] organic solvent[s] includes a solvent selected from the group consisting of: light hydrocarbon oils and short-chain alcohols.

14. (Amended) The process of claim 4 wherein [the] said [appropriate] surfactant[s] or collector [are] comprises a high HLB surfactant[s whose] having a polar head[s can] configured to interact with the surface of [the] said particulate material[s].

15. (Amended) The process of claim 4 wherein [the] said collectors are selected from the group consisting of: thiols and xanthates [for sulfide minerals and metals].

18. (Amended) A process for dewatering a slurry of [fine] particulate material[, which comprises the steps of] comprising:

i) increasing the hydrophobicity of said [rendering the particulate] material [moderately hydrophobic using appropriate means,];

ii) adding [an appropriate]at least one inorganic electrolyte[or mixtures of electrolytes] to the slurry[,];

iii) adding a nonionic surfactant of low HLB number dissolved in an [appropriate] at least one organic solvent [or mixtures of solvents,];

iv) agitating [the] said slurry to allow for [the] said nonionic surfactant [molecules] to adsorb on the surface of [the moderately hydrophobic particulate] said material so that its hydrophobicity is [substantially enhanced] increased [,]; and [then]

v) subjecting the [conditioned] agitated slurry containing [the particulate] said material[, whose water contact angle has now been greatly increased,] to a [suitable] mechanical method of dewatering[,

so that the amount of the nonionic surfactant required to achieve a desired moisture of the particulate material is substantially reduced].

19. (Amended) The process of claim 18 wherein the said [appropriate] inorganic electrolyte[s include] is selected from the group consisting of: salts of monovalent, divalent and trivalent cations and anions.

22. (Amended) The process of claim 18 wherein said particulate matter comprises particles of less than 2mm in size [the range of particle sizes is the same as for claim 1].

25. (Amended) A process for dewatering a slurry of [fine] particulate material[, which comprises the steps of] comprising:

i) increasing the hydrophobicity of said [rendering the particulate] material [moderately hydrophobic using appropriate means,];

ii) adding a nonionic surfactant of low HLB number dissolved in [an appropriate] at least one organic solvent [or mixtures of solvents,];

iii) agitating [the] said slurry to allow for [the] said nonionic surfactant [molecules] to adsorb on the surface of [the moderately hydrophobic

particulate] said material so that its hydrophobicity is [substantially enhanced] increased[,]; and [then]

iv) subjecting the [conditioned] agitated slurry containing [the particulate] said material[, whose water contact angle has now been greatly increased,] to [an appropriate] a filtration process in which [the]a filter cake formed in said filtration process is subjected to [an appropriate] vibratory means[,

so that a higher degree of moisture reduction is achieved at a given cake thickness].

26. (Amended) The process for claim **25** wherein the [appropriate] vibratory means includes means selected from the group consisting of: ultrasonic, mechanical and acoustic means.

27. (Amended) The process of claim **25** wherein said particulate matter comprises particles of less than 2mm in size [the range of particle sizes is the same as for claim **1**].

30. (Amended) A process for dewatering a slurry of [fine] particulate material[, which comprises the steps of] comprising:

i) increasing the hydrophobicity of said [rendering the particulate] material [moderately hydrophobic using appropriate means,];

ii) adding a nonionic surfactant of low HLB number dissolved in [an appropriate] at least one organic solvent [or mixtures of organic solvents,];

iii) agitating [the] said slurry to allow for [the] said nonionic surfactant [molecules] to adsorb on the surface of [the moderately hydrophobic particulate] said material so that its hydrophobicity is [substantially enhanced] increased [,]; and [then]

iv) subjecting the [conditioned] agitated slurry containing the [particulate] material[, whose water contact angle has now been greatly increased,] to [an appropriate] a filtration process in which a [suitable] surface tension lowering reagent is added during cake drying cycle time to [the] a filter cake formed in said filtration process, said surface tension lowering agent comprising a [in the form of fine] a mist [or spray,

so that a higher degree of moisture reduction is achieved at a given cake thickness].

31. (Amended) The process for claim 30 wherein the [suitable] surface tension lowering agent is selected from the group consisting of: short-chain alcohols, light hydrocarbon oils, and surfactants.

32. (Amended) The process of claim 30 wherein said particulate matter comprises particles of less than 2mm in size [the range of particle sizes is the same as for claim 1].

35. (Amended) A process for dewatering a slurry of [fine] particulate material[, which comprises the steps of] comprising:

i) increasing the hydrophobicity of said material [rendering the particles moderately hydrophobic using appropriate means,];

ii) adding [an appropriate] at least one inorganic electrolyte [or mixtures of electrolytes] to the slurry,

iii) adding a nonionic surfactant of low HLB number dissolved in [an appropriate] at least one organic solvent [or mixtures of solvents,];

iv) agitating [the] said slurry to allow for [the] said nonionic surfactant [molecules] to adsorb on the surface of [the moderately hydrophobic

particulate] said material *via* hydrophobic attraction so that its hydrophobicity is [substantially enhanced] increased [,]; [and then]

v) subjecting the [conditioned] agitated slurry containing [the particles] said material [, whose water contact angle(s) has (have) now been greatly increased,] to [an appropriate] a filtration process in which a [suitable] surface tension lowering reagent is added during the cake drying cycle time to [the] a filter cake formed in said filtration process, said surface tension lowering agent comprising a [in the form of fine] mist [or spray]; and

vi) [and at the same time the] subjecting said filter cake [is subjected to an appropriate] a vibratory means during addition of said surface tension lowering agent[,

so that a substantial moisture reduction is achieved at high cake thicknesses using minimum amounts of reagents].

36. (Amended) The process for claim 3[0]5 wherein said particulate matter comprises particles of less than 2mm in size [the range of particle sizes is the same as for claim 1].